Draft Work Plan

Elder Creek Mine Site

Cyanide Destruction and Hydrogeologic Characterization Study

Prepared for:
U.S. Army Corps of Engineers
Contract DACW05-00-D-006
Delivery Order No. 007

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Acronyms

BLM	Bureau of Land Management
$CaCO_3$	calcium carbonate
CDM	Camp Dresser & McKee Inc.
gpm	gallons per minute
HDPE	high-density polyethylene
LCRS	leak collection and recovery systems
L	liter
MWMP	meteoric water mobility potential
mg/l	milligrams per liter
NDEP	Nevada Department of Environmental Protection
NDOW	Nevada Department of Wildlife
pvc	polyvinyl chloride
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
RAMS	Restoration of Abandoned Mines
RPD	relative percent difference
RSD	relative standard deviation
SOP	Standard Operating Procedures
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
ug/L	micrograms per liter
WAD	weak acid dissociable
WPCP	Water Pollution Control Permit
WRDA	Water Resources Development Act

1.0 INTRODUCTION

1.1 OVERVIEW

This work plan has been developed by CDM in support of ongoing site characterization and cleanup activities at the Elder Creek Mine, Nevada. The work plan has been developed under U.S. Army Corps of Engineers Contract DACW05-00-D-006, delivery order no. 0006. This report has been developed under the authority of Public Law 106-53, Section 560 of the Water Resources Development Act (WRDA) of 1999. Under WRDA, Congress has provided direction to the Corps to establish the Restoration of Abandoned Mine Sites (RAMS) program. RAMS allows the Corps to provide assistance to other Federal agencies and the states in addressing abandoned mine lands issues

The work plan includes the following elements: Section 1.2 presents a description of the Elder Creek site, while sections 1.3 thru 1.5 presents various environmental issues related to conditions at the mine site. Section 2.0 presents a summary of the scope of work being governed by this work plan. Section 3.0 presents the project organization, contacts, and schedule. Section 4.0 presents the literature reviewed in developing the site description. Appendix A presents the Field Sampling Plan; Appendix C the Quality Assurance Project Plan, while Appendix C the CDM standard operating procedures that govern field data collection and recording. Appendix D presents the Health and Safety Plan governing fieldwork at the Elder Creek mine site.

1.2 ELDER CREEK MINE SITE DESCRIPTION

1.2.1 Site Location

The Elder Creek Mine site (site) is located on public lands administered by the US Department of Interior, Bureau of Land Management (BLM). The site is located in the northern part of the Shoshone Mountains of north-central Nevada, in northern Lander County, approximately 21 miles south of Battle Mountain. Access to the site is south along State Highway 305 from Battle Mountain then for 15 miles in a southeasterly direction on an existing improved dirt road up the Mill Creek Drainage to Mill Creek Summit. At Mill Creek Summit, access is over a new access road approximately 3.2 miles eastward to the site.

The site is situated on a ridge at an elevation of 7,600 feet overlooking Elder Creek to the west and the Crescent Valley to the east (Figure 1). Specifically the site is located in Sections 12 and 13 of Township 28 North, Range 45 East and Sections 7 and 18 of Township 28 North, Range 46 East, M.D.B.&M. Elevations on the site range from approximately 7,200 feet to approximately 8,100 feet. Slopes in the project area range from about 3h:1v to 1.5h:1v.

The site climate is semi-arid with a normal annual total precipitation of between 12 and 15 inches. Most of this precipitation occurs as snow. Most summer precipitation is the result of intense, localized thunderstorm activity. The maximum average annual temperature is about 56°F and the minimum average annual temperature is about 36°F.

1.2.2 Site Geology

Approximately 75 percent of the project area consists of exposed Valmy Formation. This formation is comprised of a quartzite unit, which hosts gold mineralization, a chert unit, sandstone, and a mixed chert and clastic rocks unit. The Slaven Chert, a black chert, underlies most of the remainder of the project area. The Elder Sandstone is present over only a small area in the southeast corner of the project site.

1.2.3 Site Description

The project area consists of unpatented lode claims, more specifically, the Last Lode Claim Block, located on public lands administered by the Battle Mountain District of the Bureau of Land Management (BLM) (Alta Gold Company, 1995). The following major structures and facilities are located at the site (CDM Site Visit, 2001):

- Administration Area, located at the end of a two-mile access road leading to the site. All structures have been removed, except for a possible wastewater leach field.
- Open Pit, faces toward the northeast on a hillside, with the lower benches day lighting. The highwall is approximately 100 feet high, with 4 to 5 benches.
- Waste Rock Dump, abuts the pit area on the east and southeast sides.
- Two 40-mil membrane lined leach pads (Upper Leach Pad and Lower Leach Pad) are located on the south-facing hillside at the site.
- The processing plant has been disassembled and removed from the site, although the foundation and miscellaneous piping remains.
- HDPE-lined pregnant and barren ponds are located immediately downgradient of the processing plant.

1.2.4 Site Mining History

The Elder Creek project was located in 1983 by MAPCO Minerals Corporation (MAPCO) during an intensive helicopter reconnaissance program in the Northern Shoshone Range, Lander County, Nevada. The original reconnaissance sampling showed anomalous areas defined by stream sediment and float chip samples.

Subsequent follow-up work indicated significant gold mineralization related to several small exposures of an aplitic latite dike. Samples of gray quartzite in the vicinity of the dike were also very anomalous.

On August 25 and 26, 1984, the original block of 39 claims were staked, geologic mapping was conducted, and soil sampling continued. In 1984, Resource Associates of Alaska, a subsidiary of NERCO Minerals Company (NERCO), purchased MAPCO. Claim staking continued and in 1985 the first holes were drilled in the discovery property, each subsequent year exploration efforts increased as more gold-bearing material was found. Through 1987, a total of 40 boreholes had been drilled, and numerous unpatented mining claims staked in Sections 11 through 15 of Township 28 North, Range 45 East and Sections 7 and 18 of Township 28 North, Range 46 East, M.D.B.&M.

On June 1, 1988, a joint venture was formed between NERCO and Alta Gold Company (Alta Gold), which became the Alta-NERCO Joint Venture, to further explore the Elder Creek property and other properties within the Shoshone Range. The operator of the Elder Creek Project was the Alta Gold Company. On July 1, 1991, Alta Gold acquired NERCO's interest in the Elder Creek Project becoming sole owner.

An additional 104 boreholes were drilled during the 1988 drill season, giving a total of 144 reverse circulation drill holes or approximately 35,000 feet drilled. The Alta Gold, Robinson project lab, conducted assaying of the drill samples.

Alta Gold personnel conducted the ore reserves, pit design and economics. Metallurgical testing included bottle roll tests, column leach tests, and carbon in leach tests; all were conducted by Alta Gold lab personnel (Alta Gold Company, 1989). Mining of the Elder Creek Project commenced in 1989 and continued until June 5, 1990. Operation of the leach pad and recovery of precious metals continued after cessation of mining.

Alta Gold applied for a Water Pollution Control Permit (WPCP) on August 1, 1989. The notice of Decision was issued on October 23, 1990 with Permit Number NEV89045 becoming effective November 6, 1990 (Alta Gold Company, 1995). Leaching began at the site following the issuance of the WPCP and operated continuously until January 4, 1991. Seasonal leaching took place during the summers of 1991 and 1992. Solution application ceased on September 19, 1992 and at that time the Nevada Division of Environmental Protection (NDEP) was notified that the project was going into a temporary shutdown.

On March 20, 1990, the State of Nevada Department of Wildlife (NDOW) issued an Industrial Artificial Pond Permit to the Elder Creek Mine, effective for the period April 1, 1990 to March 31, 1992. The permit was renewed in March 1992, effective for the period April 1, 1992 to March 31, 1994 and again in March 1994, effective for the period April 1, 1994 to March 31, 1995. The final renewal was issued in March 1995, effective for the period April 1, 1995 to March 31, 1996.

On April 26, 1990, the BLM issued an Incidence Report and Order for the Elder Creek Mine. During a site inspection, the BLM determined that the process components were not being built according to approved plans.

In January 1991, the NDEP was informed that the Elder Creek Mine was initiating permanent cessation of operations. The NDEP required that Alta Gold submit a reclamation permit application. The closure was only temporary due to inclement weather and a Plan of Operation and Reclamation Permit Application were submitted to the BLM on February 18, 1992. After review and several revisions, the Reclamation Permit Application was approved and the Permit (No. 0081) was issued on November 21, 1995. Alta Gold submitted a Final Permanent Closure Plan, dated July 20, 1995. However, no record of approval of the Closure Plan was found in the BLM files. On March 30, 1993, Alta Gold informed the Nevada Bureau of Mining Regulation and Reclamation of their intent to commence closure of the site.

1.3 ELDER CREEK MINE SITE ISSUES

There are several issues of concern at the Elder Creek Mine site. Those issues are summarized below (CDM Site Visit, 2001).

- The HDPE-lined pregnant and barren ponds both have leak collection and recovery systems (LCRS). The pregnant pond LCRS reports via pipeline to the barren pond. The barren pond LCRS reported to 2- 2,500-gallon tanks during operations. The line is currently disconnected near the tanks, which has been reported to leak at rates of 1 to 2 gallons per minute (gpm). No reclamation of the processing ponds has occurred.

- Two leach pads (Upper Leach Pad and Lower Leach Pad) are located on the south-facing hillside at the site. Both pads appear to have been constructed on foundation material consisting of 12 inches of barite jig material overlain by 60 inches of ore. A natural seep area is observed daylighting above the northwest corner of the Upper Leach Pad and is captured and routed to a discharge area below the pads. An order-of-magnitude estimate of the tonnage contained on each pad is 500,000 tons. Drainage from the leach pads appears to continue to report to the pregnant pond. Reclamation of the pads has not been completed, although some natural revegetation has occurred on the top of the pads.

- The processing plant has been disassembled and removed from the site, although the foundation and miscellaneous piping remains. Approximately 10 gallons of used motor oil is present in a barrel at the processing plant. HDPE-lined pregnant and barren ponds are located immediately downgradient of the processing plant. Both ponds are empty, with some residual dry sludge (approximately 2-3 inches) in the pond bottom. By walking the pond bottom, no soft spots were detected under the liner that might represent previous leakage through the pond liners.

- The waste rock dump abuts the pit area on the east and southeast sides. The sulfide-bearing shale in the pit highwall is also present in the waste rock dumps. The water supply well for the mine site is located in the drainage bottom immediately below the waste rock dump. No reclamation of the waste rock dump has been completed.

- A single open pit faces toward the northeast on a hillside, with the lower benches day lighting. The highwall is approximately 100 feet high, with 4 to 5 benches. Disseminated and massive sulfides are evident in a black shale unit exposed in the pit highwall. No reclamation has been completed within the pit area. The pit area is not fenced and only partially bermed and represents a moderate safety hazard.

- The administration area is located at the end of a two-mile access road leading to the site. The area encompasses approximately 0.5 acres and appears to have been developed by infill with overburden. All structures have been removed, except for a possible wastewater leach field.

- There are no on-site monitoring wells other than a water supply well downgradient of the waste rock dump. Potential impacts to groundwater from mining operations have not been assessed.

The former owner and operator of the site, Alta Gold Company, has filed for bankruptcy. The BLM is currently holding a reclamation bond for the site.

1.4 LEACH PAD DESCRIPTION

The two heap leach pads at the site are approximately 300 feet wide and 1,500 feet long. The pads were constructed on a cut-and-fill bench. The secondary liner is 12 inches of compacted clay with a primary liner consisting of a 40-mil membrane. Above the membrane liner is 12 inches of barite jig tails and 60 inches of ore. The pads were designed for offloading, but ore was never offloaded during mining operations (Alta Gold, 1995).

The leached ore remaining on the pad has been rinsed for detoxification. Alta Gold rinsed the heap leach residue with recycled barren solution supplemented with fresh water. The rinse solution was passed through carbon adsorption columns prior to application. The solution was land applied using sprays at an application rate of 0.003 gpm per square foot (gpm/ft^2). The pads were rinsed from July 1993 through October 1993 on a 24-hours per day, 7 days a week schedule. Rinsing was discontinued during the winter and reactivated from April 1994 through May 1994. Following completion of the rinsing process, the carbon was transferred offsite to a treatment facility for processing. The combined rinse solution from the 2 pads was sampled by Alta Gold on a weekly basis and analyzed by an outside laboratory for pH and WAD cyanide. This sampling was conducted during the first 2 months of rinsing. Following the first 2 months of rinsing, the discharge from each pad was sampled separately. The final sample was collected on May 20, 1994 and analyzed for Profile II constituents. All of the constituents detected by this analysis were below National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs) (EPA, 1999) and the limitations of the Alta Gold Company WPCP (State of Nevada, 1990) for each leach pad with the exception of the following parameters: pH, nitrate/nitrogen, sulfate, total dissolved solids, antimony, and arsenic.

Rinsing was discontinued following collection of the final sample. The fluid management system was intact and functional in 1995 (Alta Gold, 1995); its condition is unknown at present.

Requirements of the WPCP included monitoring 7 leak detection ports for the heap leach pads (S1 through S7), shallow monitoring points (SM1 through SM3) as wells as one each for the pregnant (PPS) and barren pond (BPS) leak detection sumps, pregnant and barren solutions, and the water supply well (State of Nevada, 1990). The last samples collected from these locations, except from the water supply well, were reported on March 30, 2000 (Alta Gold, 2000). There are no records of samples being collected from the water supply well during operation of the mine.

Prior to leaving the site, Alta Gold cut six trenches into the heap material from the top of the heap to within five feet of the liner. Three composite samples of the ore were collected from the trenches and analyzed for Meteoric Water Mobility Potential (MWMP). Following sample collection, Alta Gold recontoured the heap leach pads to cover the liner material. Some of the heap material was pushed off the liner to reduce the potential for future slope failure. Alta Gold also placed a horizontal drainage cut above both pads, which was lined with a 40-mil PVC liner and compatible with the liner existing below the heap leach pads. This was done to divert run-on water around the pads. On the down slope of the pads, the liner was folded back onto the heap leach pads. A sump is located on each pad to collect meteoric water (Alta Gold, 1998).

1.5 UNKNOWN LIQUID CHARACTERIZATION

The processing plant has been disassembled and removed from the site, although the foundation and miscellaneous piping remains. Approximately 10 gallons of fluid, thought to be used motor oil, is present in a barrel at the processing plant (CDM, 2001). The process area used to consist of a metal building that housed the reagent mix and storage tanks as well as five 8-foot by 8-foot carbon columns, power generators, and associated pumps. The process area is located upgradient of the pregnant solution pond.

Insert Figure 1: Elder Creek Site Map

2.0 SCOPE OF WORK

2.1 TASK 1 - ADMINISTRATIVE ITEMS

2.1.1 Subtask 1.1 – Program Level Meetings

CDM will participate in two program-level meetings to be held either in Reno or Carson City, Nevada. The meetings will be attended by the project manager and lead engineer for the project. Following each meeting, CDM will prepare meeting minutes and submit them to the Corps within 3 working days of the meeting.

2.1.2 Subtask 1.2 – Teleconferences

Based on instructions provided by the Corps, CDM will coordinate and hold up to 15 teleconferences in which the Bureau of Land Management (BLM), the Corps, and other interested parties (e.g., the state of Nevada) will participate. Based on instructions and input from the Corps and BLM regarding the purpose of each teleconference, CDM will submit an agenda for each teleconference within 2 working days of the teleconference. CDM will be responsible for recording meeting minutes and providing the minutes to the participants within 2 working days of the teleconference. The teleconferences will occur as directed or determined by the Corps or the BLM. For purposes of estimating, it is assumed that there will be ten 1-hour conferences and five 2-hour conferences (for a total of 15 teleconferences over the 2-year period of this assignment). The project manager and lead engineer will participate in each teleconference.

2.1.3 Subtask 1.3 – Weekly Status Reports

CDM will prepare and submit to the Corps and the BLM weekly status reports summarizing the activities that occurred during the previous week. If no work occurred, then a simple statement of that fact will be provided. Preliminary analytical or geotechnical results will accompany the weekly report, as applicable. The period of service for the active field work is estimated to be 24 weeks.

2.1.4 Subtask 1.4 – Weekly Field Reports

During the active field work portion of the project, estimated to be eight weeks, CDM will submit to the Corps on a weekly basis, copies of field logs and forms. The field records will include:

- Identification of standby time
- Date and time work commenced and ended
- Weather and temperature
- Type (s) of equipment used
- Names of personnel working at the site
- Names of visitors to the site
- Conditions encountered

2.1.5 Subtask 1.5 - Correspondence Log

CDM will maintain a correspondence log of all telephone conversations pertinent to this project, including telephone calls, meetings, and summaries of discussions related to the project. CDM will provide copies of the logs to the Corps within 3 calendar days of the event.

2.2 TASK 2 – LEACH PAD STABILIZATION

2.2.1 Leach Pad Description

The two heap leach pads at the site are approximately 300 feet wide and 1,500 feet long. The pads were constructed on a cut-and-fill bench. The secondary liner is 12 inches of compacted clay with a primary liner consisting of a 40-mil membrane. Above the membrane the liner is 12 inches of barite jig tails and 60 inches of ore. The pads were designed for offloading, but ore was never offloaded during mining operations. The leached ore remaining in the pad has been rinsed for detoxification. Alta Gold rinsed the heap leach residue within recycled barren solution supplemented with fresh water. Following the first 2 months of rinsing, the discharge from each pad was sampled separately. The final sample was collected on May 20, 1994, and analyzed for Profile II constituents. All of the constituents detected in the analysis were below MCLs and the limitations of the Alta Gold Company WPCP with the exception of pH, nitrates, sulfates, total dissolved solids, antimony, and arsenic.

2.2.2 Subtask 2.1 – Leach Pad Effluent Sampling

CDM will collect leach pad effluent samples from both leach pads and analyze the samples for WAD cyanide, total cyanide, and Profile II drinking water constituents. As part of this sampling activity, samples will also be collected from the spring located near the leach pads and from the downgradient water well. These two water sources will be analyzed for the same constituents. A total of five samples will be collected, the four primary samples and one QA/QC duplicate. The sampling will be performed during the spring of 2003 in accordance with SOPs 1-1, 1-5, and 1-6 (Appendix C). Table 1 presents a summary of the sampling effort.

Table 1
Summary of Leach Pad Effluent Samples

Sample Location	Sample Analytes	Sample Number
Heap Leach Pad 1	Total cyanide, WAD cyanide, Profile II constituents	1
Heap Leach Pad 2	Total cyanide, WAD cyanide, Profile II constituents	2[1]
Spring	Total cyanide, WAD cyanide, Profile II constituents	1
Water Well	Total cyanide, WAD cyanide, Profile II constituents	1

[1]Includes a quality control duplicate sample for all analytes

2.2.3 Subtask 2.2 – Cover Material Area Reconnaissance

The leach pads and ponds will need to be closed in accordance with NDEP requirements, more than likely through closure in place using a soil cover. Sufficient soil borrow material will be necessary to accomplish the closure. Due to costs for purchase and hauling of cover soil, the most appropriate source for the cover will be local materials.

In order to determine whether adequate cover soil is available in the area of the mine site, CDM will conduct a reconnaissance of the area to evaluate cover material/borrow area sources for reclamation activities. The reconnaissance will involve walking the area and visual inspecting cover soil for sufficient material for site closure. As suitable areas are identified, the areas will be mapped for depth of available soil determinations. Depth of available soil will be determined through the use of a backhoe that will dig soil profile trenches for visual inspection. All trenches will be immediately refilled once the soil profile is determined. Following the field surveys, the quantities available for reclamation will be determined for proposed source location. The determination will include the evaluation of the feasibility of also restoring the borrow source locations.

2.2.4 Subtask 2.3 – Leach Pad Area Survey

CDM will complete a physical land survey of the leach pad area and produce a working topographic map. The physical survey is necessary to address NDEP requirements for the legal description to be incorporated into the closure plan for the mine ore process system CDM will perform a limited geotechnical review of the existing Alta Gold reclamation plan for the leach pads to verify that the liner system is adequate for closure of the facility in place. The Alta Gold leach pad reclamation plan will be modified if necessary based on this review and NDEP requirements for leach pad closure. CDM will submit a recommended grading plan and cover requirements with the site characterization report (Task 6). The cover requirements evaluation will consider soil and engineered capping technologies. The evaluations will include the use of HELP model simulations. The model results along with the closure cost estimate will be included in a leach pad reclamation report.

2.3 TASK 4 – WASTE PILE/HEAP EVALUATION

The waste rock piles remaining at the site contain sulfide-bearing minerals that potentially can lead to acid production leaching metals from the ore. It is possible that waste rock containing high levels of sulfides will have to be contained beneath the soil covers planned for the process facilities (lead pads and ponds). To support the decision regarding handling and containment of the waste rock, CDM will perform a visual survey of all waste rock and heap piles for the percent of sulfide-bearing minerals. CDM will plot the locations of waste rock piles and the heaps on a site map, noting areas of high shale content. CDM will estimate the total volume of waste rock, heap material, and shale material present at the site. Should the visual surveys identify a need for further investigation, CDM will develop recommendations, for inclusion in the Closure Plan (Site Report section), for testing the site for potential acid drainage problems.

2.4 TASK 5 – DRAINDOWN WATER MANAGEMENT DEMONSTRATION PROJECT

The BLM and the Nevada Division of Environmental Protection (NDEP) have expressed interest in evaluating a demonstration technology to address contaminants in the leach pad effluent. The principal contaminants of concern are nitrate and heavy metals. A passive anaerobic constructed wetland is proposed as an appropriate technology demonstration considering the constituents requiring treatment and existing site facilities available. The demonstration project includes the following subtasks:

- Evaluation of existing technologies, up to 6 alternatives
- Proposal of preliminary design (30% - 60% design)
- Permitting of the demonstration project
- Preparation of design specification documents
- Construction of the demonstration treatment project
- Monitoring of the demonstration treatment project performance. The BLM will perform monitoring, with CDM being present in the field for one monitoring event. CDM will coordinate with the laboratory to analyze the samples collected by the BLM.

Based on the field investigations performed under tasks 2 and 4, CDM will develop a proposed water demonstration plan for submittal to the Corps, BLM, and NDEP for approval. The plan will include the objectives of the study, treatment alternatives evaluated and rationale for selection of the preferred demonstration project, the preliminary design, permitting requirements, sampling and analysis procedures, and project schedule. Following acceptance of the plan, the demonstration project will be constructed. CDM will be responsible for conducting the first two field monitoring (sampling and analysis) activities prior to turning the monitoring program over to the BLM.

2.5 TASK 6 – REPORTS

CDM will prepare a site characterization report presenting the results of all field investigations. Prior to submittal of the report, CDM will prepare a detailed outline of the report of field investigations and submit it to the Corps for review and comment. The outline will be provided in Microsoft Word format.

Following acceptance of the outline by the Corps, CDM will prepare a report presenting the results and findings of each of the tasks outlined above. Analytical data will be presented in tabular form. Supporting information will be included in appendices. The report will discuss additional steps/activities required to resolve long-term contamination issues at the Vita Grande Mine site. CDM will provide the report in draft form to the Corps for Corps review. The Corps will provide comments to CDM requiring revision of the document. Following incorporation of Corps comments, CDM will finalize the document.

3.0 PROJECT ORGANIZATION AND SCHEDULE

3.1 PROJECT ORGANIZATION AND CONTACTS

This project is being managed by CDM under the direction of the Corps. Key project personnel and contacts are listed below.

Individual	Role	Organization
B.J. Bailey	Project Manger	Army Corps of Engineers
Neal Brecheisen	Project Manager	Bureau of Land Management
Kevin Ryan	Project Manager	CDM
Kerri Dierberger	Field Team Manager	CDM
John Wondolleck	Contract Manager	CDM

3.2 SCHEDULE

The project schedule is presented on the following pages.

Proposed Schedule, page 1 of 2

Proposed Schedule, page 2 of 2

4.0 REFERENCES

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Appendix A

FIELD SAMPLING PLAN

Contents

1.0 INTRODUC TION

This Field Sampling Plan (FSP) presents the field sample and data collection procedures to be employed to address the objectives of the additional site characterization and pilot testing planning described in the Work Plan. The FSP includes references to Standard Operating Procedures (SOPs) that will be followed in order to assure that all samples collected will be representative of the physical and chemical characteristics of site media.

The field sampling activities addressed as part of this FSP include:

- Sampling of cyanide waste for development of a pilot testing plan
- Sampling of groundwater to complete hydrogeologic characterization of the site area
- Sampling of tailing materials to identify waste characteristics and tailings depth.

The intended use of the data collected under the guidance of this FSP is to provide the Bureau of Land Management (BLM) with information and recommendations to address treatment and containment of wastes found at the Elder Creek Mine site to support closure of the site under Nevada Department of Environmental Protection (NDEP) requirements.

2.0 OBJECTIVES OF FIELD SAMPLING

2.1 LEACH PAD

Meteoric (rain) water that comes in contact with the wastes remaining on the leach pads potentially can transport metals and nitrates into the environment. In order to determine the existing leaching potential and to support closure of the pads, samples of the materials for cyanide and metals presence and for meteoric water leaching potential, will need to be collected. Issues related to sampling of the leach pads are described in Section 2.2 of the Work Plan. The results of the sampling effort will be presented in the Draindown Water Management Demonstration Project Testing Plan.

2.2 GROUNDWATER/SURFACE WATER CHARACTERIZATION

To determine whether local sources of water can be used as part of the demonstration project, samples of surface water, from a groundwater seep, and of groundwater, from an existing well, will be collected. The results of the sampling will be used to determine whether these water sources are of the proper quality for on-site testing purposes.

2.3 PROCESS AREA LIQUID SAMPLING

A drum containing what may be motor oil will need to be sampled for waste characterization and disposal purposes. If the sampling results indicate that the drum only contains motor oil, the motor oil will be recycle in accordance with NDEP requirements. If the drum contains liquids other than motor oils (e.g., solvents) recommendations for proper disposal will be provided to the BLM.

3.0 FIELD SAMPLING PROCEDURES

3.1 INTRODUCTION

Presented in this section are summaries of the field sampling procedures to be employed by CDM while performing the work scope described in Section 2.0. All sample collection, recording, handling, and shipment will be in accordance with CDM standard operating field procedures (SOP) that are included in Appendix C.

3.2 LEACH PAD SAMPLING ACTIVITIES

A total of five samples, inclusive of a QA/QC duplicate, will be collected, one from each leach pad, a proximal spring, and a downgradient well. Samples will be collected in accordance to the SOPs identified in Appendix C. Laboratory analysis for the all the samples will include Profile II constituents and total and weak acid dissociable (WAD) cyanide.

3.2.1 Leach Pad Effluent Sampling

A liquid sample from each leach pad effluent will be collected directly in the sample containing based on sample collection, handling and shipment procedures presented in Appendix C. Table A-1 presents the analytical procedures, sample container, and sample preservation requirements for the effluent samples.

Table A-1
Sample Analytes, Analytical Methods, Matrices, Containers and Preservatives

Analyte	Analytical Method[1]	Matrtix	Sample Container	Preservative
Total Cyanide	USEPA 335.2	Water	1 liter poly	NaOH to pH > 12 Ice to < 4ºC
Free Cyanide	USEPA 335.2	Water	1 liter poly	NaOH to pH > 12 Ice to < 4ºC
WAD Cyanide	USEPA 1677		1 liter poly	Ice to < 4ºC
Total Metals	USEPA 200.8	Water	1 liter poly	HNO_3 to pH <2 Ice to < 4ºC
Alkalinity	SM 2320B	Water	1 liter poly	Ice to < 4ºC
pH	USEPA 9040B	Water	1 liter poly	Ice to < 4ºC
Chloride	USEPA 300.0	Water	1 liter poly	Ice to < 4ºC
Fluoride	USEPA 300.0	Water	1 liter poly	Ice to < 4ºC
Nitrate/nitrite	USEPA 300.0	Water	1 liter poly	Ice to < 4ºC
Phosphorus	USEPA 365.1	Water	1 liter poly	Ice to < 4ºC
Sulfate	USEPA 300.0	Water	1 liter poly	Ice to < 4ºC
Total dissolved solids	SM 2540C	Water	1 liter poly	Ice to < 4ºC

[1]Or equivalent method achieving required detection limits. See Appendix B for analytical procedures.

The SOPs that govern the collection of the surface water samples are presented in Appendix C and are listed below:

- SOP 1-1 Surface Water and Sediment/Sludge Sampling (pages: 1- 6; 14)
- SOP 1-2 Sample Custody (pages: all)
- SOP 1-3 Surface Soil Sampling (pages: 1-3; 11-12)
- SOP 2-1 Packaging and Shipping of Environmental Samples (pages: 1-4)
- SOP 4-1 Field Logbook Content and Control (pages: all)
- SOP 4-2 Photographic Documentation of Field Activities (pages: all)
- SOP 4-5 Field Equipment Decontamination at Non-radioactive Sites (pages: all)

3.2.2 Spring Sampling

A sample from the spring located in proximity to the leach pad will be collected following the SOPs listed below:

- SOP 1-1 Surface Water and Sediment/Sludge Sampling(pages: 1- 6; 14)
- SOP 1-2 Sample Custody (pages: all)
- SOP 2-1 Packaging and Shipping of Environmental Samples (pages: 1-4)
- SOP 4-1 Field Logbook Content and Control (pages: all)
- SOP 4-2 Photographic Documentation of Field Activities (pages: all)
- SOP 4-5 Field Equipment Decontamination at Non-radioactive Sites (pages: all)

The surface water sample will be analyzed for the analytes presented in Table A-1.

3.2.3 Water Supply Well

A sample will be collected from the water well located downgradient of the leach pads. Prior to sample collection the well will be purged three sample volumes, or until temperature, pH and conductivity stabilize. The purge water identified as investigation derived waste will be contained in 55-gallon drums until receipt of analytical results. The drum(s) will be labeled to include: activity, content, date of collection, location of collection, and point of contacts. Until disposal is determined by BLM the drum(s) will be stored at a secured location at the site.

After the well water has been purged and stabilized (Table A-2) presents the stabilization criteria, a water sample will be collected utilizing a bailer and transferred directly into laboratory provided containers.

Table A-2
Well Purgewater Stability Criteria

Parameter	Criteria
Temperature	± 1 ºC
pH	± 0.5 pH units
Conductivity	± 1.0 µS/cm
Turbidity	± 1 5.1 NTU

The SOPs that govern the collection of the monitoring well sample are presented in Appendix C and are listed below:

- SOP 1-2 Sample Custody (pages: all)
- SOP 1-5 Groundwater Sampling Using Bailers (pages: 1-5)
- SOP 1-6 Water Level Measurements (pages: 1-5; 8-9)
- SOP 2-1 Packaging and Shipping of Environmental Samples (pages: 1-4)
- SOP 4-1 Field Logbook Content and Control (pages: all)
- SOP 4-2 Photographic – Documentation of Field Activities (pages: all)

The groundwater sample will be analyzed for the analytes presented in Table A-1.

Appendix B

QUALITY ASSURANCE PROJECT PLAN

Contents

List of Tables

1.0 PROJECT MANAGEMENT

This Quality Assurance Project Plan (QAPP) documents the project organization; presents the analytical procedures being used to produce data for the samples collected under the Field Sampling Plan (FSP); and, identifies the analytical and data review procedures to ensure the accuracy, precision, and representativeness of the samples so that project objectives presented in the FSP are met. This QAPP is one component of the Work Plan and FSP being developed to produce chemical data of know quality at the Elder Creek Mine Site, Nevada.

This QAPP has been reviewed by the CDM project QA coordinator, who will also maintain QA oversight for the duration of the project. All work performed on this project will be in accordance with the CDM QA Program described in CDM Federal's *Quality Assurance Manual* (CDM, 2001). All deliverables produced during the fieldwork and investigation will be subject to technical review by CDM technical specialists. Deliverables presenting measurement data will also be reviewed by an approved CDM QA reviewer. All documents developed during this project will be under the control of the CDM project manager who will maintain the project files. Audits or field surveillances will be performed in accordance with CDM Federal requirements.

1.1 PROJECT ORGANIZATION

Key positions and associated responsibilities for all individuals responsible for project management, data collection, data reporting, and review are provided below. Included are the functions of each individual and their lines of authority.

Bureau of Land Management Project Manager – Roger Tallini

- Review and approval of the project work plan and deliverables
- Review of field reports
- Provide project direction and oversight

United States Army Corps of Engineers Project Manager – B.J. Bailey

- Communicate with BLM Project manager project objectives and content
- Issue and oversee contractual issues
- Assure delivery of data and project deliverables to BLM
- Review project technical and data reports
- Provide project oversight

CDM Project Manager – Kevin Ryan

- Provide technical direction for all field activities
- Review and approve CDM deliverables

- Ensure compliance with project schedule
- Implement corrective or other actions necessary to complete the project scope

CDM Project Quality Assurance Manager – George Delullo

- Review QAPP and FSP for compliance with CDM's QA program
- Provide technical direction to the Project Manager and Field Team leader on quality assurance issues
- Conduct audits/surveillances of project reports for verification for adherence to the quality control procedures identified in this QAPP and the FSP

CDM Field Team Leader – Kerri Dierberger

- Assure that all sampling is conducted in accordance with the FSP and supporting SOPs
- Verify that all QC procedures are followed and QA samples are collected and managed in accordance with the QAPP
- Report any sampling problems to the Project Manager
- Assure completion of the field log book, field record sheets, and chain-of-custody forms

Analytical Laboratory – Sierra Analytical

- Provide pre-cleaned sample containers of the size and type listed in the FSP
- Conduct chemical analyses in accordance with the analytical procedures identified in this QAPP
- Calibrate and maintain equipment in accordance with manufacturers recommendations and the laboratory's QA plan
- Conduct internal QA/QC checks/procedures and provide CDM with verification records upon request
- Notify CDM's QA manager of any laboratory problems that jeopardize the quality of sample data or fail to address analytical method QC limits
- Deliver analytical reports in accordance with the subcontract agreement including results, QA/QC documentation, problems and corrections, and custody records.

1.2 PROJECT DESCRIPTION

1.2.1 Site Background

Background information regarding the Elder Creek Mine site and environmental issues that need to be addressed are provided in Section 1.0 of the Work Plan.

1.2.2 Data Acquisition Activities Governed by this QAPP

Three distinct sampling activities will occur as described in Section 2.1, 2.2, and 2.3 of the Work Plan. These activities include

- Sampling of leach pad effluent for cyanide waste and Profile II constituents for use in characterizing the waste for treatment and/or disposal considerations
- Sampling of a groundwater seep for determination of water quality relative to on-site usage.
- Sampling of an existing monitoring well for determination of water quality relative to on-site usage.
- Sampling of a drummed liquid for use in waste classification and disposal method determination

Sampling procedures are described in the FSP. Section 3.0 of this QAPP provides the analytical procedures. Table B-1 provides a summary of the analytical schedule for sampling activities at the Elder Creek Mine site.

1.2.3 Special Training Requirements/Certifications

The Elder Creek mine site will be treated as hazardous waste site for purposes of identifying safety practices during field sampling and data collection. Appendix D presents the Health and Safety Plan. All personnel who enter an abandoned mine site must recognize and understand the potential hazards to health and safety associated with the site. All employees involved in sampling and site inspection activities will have training that meets the OSHA hazardous waste site worker 40-hour training requirement. Personnel responsible for the use of field instruments, sampling equipment, operating mechanical equipment, and powered equipment will receive necessary training for the safe and proper use of the equipment. Field activities will also be directed by a qualified geologist or engineer.

2.0 ANALYTICAL AND QUALITY CONTROL PROCEDURES

2.1 ANALYTICAL PROCEDURES

Table A-1 of the FSP presents a summary of the analytical method, sample matrix, sample container, and sample preservative requirements for the analyses being performed under this program. Table B-2 presents the analytes with their respective detection limits for each matrix (water and soil). Table B-1 provides a summary of the samples to be collected by sampling locations with reference to the respective FSP Section.

Table B-1
Summary of Analytical Schedule
Elder Creek Mine, Nevada

Sample Location(s)	Matrix	Parameters	Estimated Number of Samples	Field Duplicates	MS/MSD	Reference
Leachate Pad	Water	Total, WAD, Free Cyanide, Metals, Profile II	2	1	1	FSP Sect. 3.2
Groundwater seep (spring)	Water	Total, WAD, Free Cyanide, Nevada Profile II, Field Parameters	1	0	0	FSP Sect. 3.3.1
Monitoring Well	Water	Total WAD, Free Cyanide, Nevada Profile II,Field Parameters	1			FSP Sect. 3.3.2

2.2 MEASUREMENT/DATA ACQUISITION

2.2.1 Sample Handling and Custody Requirements

Procedures for sample handling and chain-of-custody control are provided in SOP 1-2 (Appendix C). The procedures within this SOP will be strictly adhered to during sample collection, transportation, and laboratory handling to ensure that the identity of the sample is maintained and that the sample is received intact and preserved in accordance with the procedure. Sample labeling and chain-of-custody development will also be in accordance with the SOP.

2.2.2 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Instrument calibration will be performed to ensure that all instrument functions are operating properly and the readings/measurements made by the instrument accurately reflect the conditions of the material being testing. Calibration of all instruments will be based on the manufacturers requirements. Calibration materials will be of known quality, concentration, and traceable to their sources. Field instruments will be calibrated at least daily or at a more frequent interval specified by the manufacturer.

The analytical laboratory will maintain and calibrate its equipment and instruments in accordance with its internal quality assurance program requirements. Criteria used for calibration will be derived from the manufacturers specifications and the requirements of the analytical procedure being followed. All calibration materials used by the laboratory will be traceable to a known source.

Table B-2
Sample Analytes and Detection Limits
Elder Creek Mine Site

Analyte	Analytical Method Water	Detection Limit Water (µg/L)
Total Cyanide	USEPA 335.2	25
Free Cyanide	USEPA 335.2	25
WAD Cyanide	USEPA 1677	5
Antimony	USEPA 200.8	10
Arsenic	USEPA 200.8	5
Barium	USEPA 200.8	10
Beryllium	USEPA 200.8	4
Cadmium	USEPA 200.8	5
Chromium	USEPA 200.8	5
Cobalt	USEPA 200.8	10
Copper	USEPA 200.8	10
Lead	USEPA 200.8	5
Mercury	USEPA 245.1	0.2
Molybdenum	USEPA 200.8	20
Nickel	USEPA 200.8	10
Selenium	USEPA 200.8	5
Silver	USEPA 200.8	10
Thallium	USEPA 200.8	5
Vanadium	USEPA 200.7	10
Zinc	USEPA 200.7	20
Alkalinity	USEPA 310.1	1 mg/L $CaCO_3$
PH	USEPA 9040B	0.1
Chloride	USEPA 300.0	0.005
Fluoride	USEPA 300.0	0.001
Nitrate/Nitrite	USEPA 300.0	0.0005
Phosphorus	USEPA 365.1	0.0002
Sulfate	USEPA 300.0	0.00002
Total Dissolved Solids	USEPA 160.1	0.1
Meteoric Water Extraction		

2.2.3 Inspection Requirements for Supplies and Consumables

All purchased supplies and consumables that support field monitoring and sampling activities or that have a direct relationship to sample quality (e.g., calibration standards, sample containers, decontamination fluids) will be inspected on receipt and noted in the field log book as origin of material and identification number(s) before the materials are used. At a minimum the inspection will include part, serial, or lot number; whether the material meets the requirements of the FSP and QAPP; whether the material is intact and has not been compromised (as to introduce foreign matter); and whether necessary documentation has been provided by the vendor.

Any non-conforming items will marked as not usable, set aside, and eventually returned to the vendor for replacement or other action as necessary.

2.2.4 Field Parameter Measurements

Field parameters will be measured during leach pad, seep, and groundwater sampling. The field parameters to be measured include:

- Conductivity
- Dissolved Oxygen
- pH
- Temperature
- Turbidity

CDM will operate the instruments in accordance with manufacturer's procedures provided with the instruments: Decision criteria for instrument readings are provided in the Table A-2 of the FSP. All readings will be recorded in the field log book. Instruments will be maintained and calibrated in accordance with the manufacturer's specifications.

3.0 DATA QUALITY CRITERIA

3.1 DATA REVIEW AND VERIFICATION REQUIREMENTS

The analytical laboratory performing the chemical tests listed in Table B-3 will responsible for reviewing all analytical data generated under the guidance of this QAPP to ensure that it meets all requirements. Each analyst will be responsible for reviewing the quality of their work based on the established protocols of the specific laboratory's SOPs, analytical method protocols, and project-specific requirements stated in the laboratory's subcontract. The laboratory will provide results in electronic and paper formats. At a minimum, the laboratory's data reviewer will check the sampling documentation (chain-of-custody), holding time, instrument calibration and tuning, lab blank sample analyses, method QC sample results, and the presence of any elevated detection limits.

Table B-3
Data Quality Objectives

Task	DQO Step	Investigation Statement	Work Plan Reference
Leach Pad Effluent Sampling	State the Problem	Water being discharged from the leach pad may contain elevated concentrations of metals and nitrates requiring treatment for environmental protection considerations	Section 2.2
	Identify the Decision	One representative sample will be collected from each pad for cyanide at Profile II characterization.	
	Identify Inputs to the Decision	The data will be used to identify treatment options for the effluent.	
	Define the Study Boundaries	The study boundaries reflect the two leach pads and immediate environs.	
	Develop a Decision Rule	If it is determined that leachable quantities of metals and nitirates are generated, a program for treatment of the leachate will be developed.	
	Specify the Limits on Decision Error	Limits on analytical error are the internal laboratory DQOs including control limits for MS/MSD and LCS percent recovery, surrogate percent recovery, and detection limits.	
	Optimize the Design	By sampling the locations only once, sufficient data are expected to be generated to meet the DQOs.	
Groundwater Seep/ Well Sampling	State the Problem	The quality of site groundwater relative to a surface seep (spring) and that beneath the sites is not known. If of sufficient quality, the water may be used as part of the leach pad treament demonstration project.	Section 2.3.5
	Identify the Decision	The seep will be sampled at the point of discharge. The well will be sampled at the wellhead.	
	Identify Inputs to the Decision	Analytical data will be incorporated into trends data for action determination relative to the MCLs and NDEP water quality criteria.	
	Define the Study Boundaries	The study boundaries are the locations of the seep and site well.	
	Develop a Decision Rule	Water meeting NDEP water quality criteria will be used in the demonstration project. If the quality is poor, its status will be documented in the demonstration plan document.	
	Specify the Limits on Decision Error	Limits on analytical error are the internal laboratory DQOs.	
	Optimize the Design	This category is not applicable to the water characterization effort.	

Task	DQO Step	Investigation Statement	Work Plan Reference
Tailings Impoundment Characterization	State the Problem	The depth of tailings is not known. The chemical characteristics of the tailing for closure purposes need to be understood.	Section 2.4
	Identify the Decision	The chemical characteristics of the tailing will dictate closure requirements. If not hazardous, the tailings can be closed via a simple soil cover.	
	Identify Inputs to the Decision	Data will be utilized to determine the suitability of the tailing to simple soil cover.	
	Define the Study Boundaries	The study boundaries will be limited to tailings Dam 4.	
	Develop a Decision Rule	If the tailings results indicate leachable levels of cyanide, a cover preventing infiltration will need to be designed.	
	Specify the Limits on Decision Error	Limits on analytical error are the internal laboratory DQOs including control limits for MS/MSD and LCS percent recovery, surrogate percent recovery and detection limits.	
	Optimize the Design	The appropriate numbers of samples will be collected depending on the depth of the waste. Therefore, sufficient data is expected to be generated to meet the DQOs.	

A CDM data reviewer will check the documentation provided by the analytical laboratory to ensure that the information is complete and supports the analytical results. The CDM data reviewer will also review duplicate analyses and any field blanks for compliance with the precision goals established for the project.

3.2 LABORATORY QUALITY CONTROL

The laboratory's overall method performance will be monitored by the inclusion of various QC checks that allow an evaluation of method control (batch QC), and the effect of the matrix on the data being generated (matrix-specific QC). Batch QC is based on the analysis of a laboratory control sample (LCS) to general accuracy (precision and bias) data and method blank data to assess the potential for cross-contamination. Matrix-specific QC will be based on the use of an actual environmental sample for precision and bias determination from the analysis of matrix spike (MS), matrix-spike duplicate (MSD), and surrogate procedures. Laboratory QC will also be based on the labs internal QA/QC plan and SOPs.

3.2.1 Method Blank Samples

Method Blanks are analyzed by the laboratory to assess background interference or contamination that exists in the analytical system that might lead to reporting of elevated concentration levels or false positive data. The method blank is defined as an interference-free blank matrix similar to the sample matrix to which all reagents are added in the same volumes or proportions as used in sample preparation and carried through the complete sample preparation, cleanup, and determination procedures. For aqueous analyses, analyte-free reagent water would typically be used. The results of the method blank analysis are evaluated, in conjunction with other QC information, to determine the acceptability of the data generated for that batch of samples. Sample results will not be corrected for blank contamination.

In general, one method blank sample shall be analyzed for each analytical batch (one every 12 hours for GC/MS analyses). Contamination in method blanks (as well as reagent blanks, instrument blanks, extraction blanks for elutriations, initial calibration blanks, and continuing calibration blanks) above the method detection limit (MDL) is not allowed. Data found to be associated with blanks containing target analytes at or above the MDL may be rejected with resampling and/or re-extraction and reanalysis at the expense of the laboratory. A CDM data reviewer will evaluate the data based on the level detected in the associated samples.

3.2.2 Laboratory Control Samples

The LCS is analyzed to assess general method performance by the ability of the laboratory to successfully recover the target analytes from a control matrix. The LCS is similar in composition to the method blank. Analtyte free water is used for aqueous analyses. A purified solid matrix is used for soil samples. Due to the difficulty of obtaining a solid matrix free from metals, analyte-free reagent water is taken through the appropriate digestion procedures for metals analysis. The LCS is spiked with all single-component target analytes before it is carried through the preparation, cleanup, and determinative procedures. The laboratory will perform corrective action based on failure of any analyte in the spiking list. When samples are not subject to a separate preparatory procedure, the continuing calibration verification (CCV) may be used as the LCS, provided that the CCV acceptance limits are used for evaluation. The spiking levels for the LCS would normally be set at the project-specific action limits assuming that the low standard used for the initial calibration was below this limit. If the low standard used was at this limit or if the site action levels were unknown, then the spiking levels would be set between the low and mid-level standards. The results of the LCS are evaluated in conjunction with other QC information, to determine the acceptability of the data generated for the batch of samples. The laboratory shall also maintain control charts, or tables for these samples to monitor the precision. The precision may be evaluated by comparing the results for the LCS batch-to-batch or duplicate LCSs.

3.3 DATA QUALITY OBJECTIVES

Data quality criteria address precision, accuracy, representativeness, completeness, and comparability (i.e., PARCC indices) of the data. A brief description of each parameter is provided below. The data quality objectives for the sampling and analytical program governed by this QAPP are provided in Table B-3.

3.3.1 Precision

Precision refers to the level of agreement among repeated measurements of the same characteristics, usually under a given set of conditions, and is expressed quantitatively as a measure of variability of a group of measurements compared to their average value. Precision can be expressed as the standard deviation and as relative percent difference (RPD) between measurements of the same parameter. Relative standard deviation (RSD) may also be calculated. For this project, laboratory duplicate analyses will be used to assess analytical precision.

3.3.2 Accuracy

Accuracy refers to the degree to which a measurement agrees with an accepted reference or true value. Accuracy is a measure of bias in a measurement system. Sources of error that introduce bias are the sampling process, field contamination, preservation, sample handling, matrix, sample preparation, analysis techniques, and data reduction. Analytical accuracy will be assessed using laboratory standard reference materials.

3.3.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Subjective factors to be taken into account are the degree of homogeneity of a site, the degree of homogeneity of a sample taken from one point at a site, and the available information on which a sampling plan is based.

For this project, field duplicates will be collected and analyzed to assess representativeness. Two samples collected from the same location and at the same time are considered to be equally representative of the condition, at a given point in space and time.

The laboratory's objective for representativeness is to ensure that sample data accurately represent the distinguishing characteristic of a sample source. Laboratory analytical procedures, such as the homogenization of a sample prior to aliquot removal, will ensure that each aliquot represents the whole sample from which it was extracted. Thus, laboratory procedures will not interfere with the concentration or composition of the analytes in the sample.

3.3.4 Completeness

Completeness is a quantitative measurement of the amount of valid, usable data obtained from a measurement system compared to the amount expected under normal conditions. A certain amount and type of data must be collected in order for conclusions based on that data to be deemed valid. Due to the limited number of samples proposed for collection under this work plan, a completeness goal of 100% is required in order to meet the overall project objectives.

3.3.5 Comparability

Comparability represents the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved sample collection techniques and analytical methods, consistency in the basis of analysis (weight, volume etc.), consistency in reporting units, and analysis of standard reference materials. The data generated during one groundwater sampling round will be comparable to data generated during any other groundwater sampling round at by using the same standard unit of µg/L (micrograms per liter).

A State of Nevada-certified analytical laboratory will use standard operating procedures as described in their QA plan. USEPA-approved sampling and analytical methods will be used.

4.0 QUALITY CONTROL RESPONSIBILITIES

All of the selected staff for this project have the qualifications and experience required for conduction their specific assignments. If staff changes are necessary during the execution of this work, resumes shall be submitted for new personnel, and a description of their responsibilities, in a technical memorandum to the USACE Project Manager. All CDM project personnel are responsible for identifying, reporting, and documenting any activities that could adversely affect the quality requirements set forth by the contract.

The laboratory has a designated project manager for this project and who will provide direct interface with CDM personnel. The Laboratory Project Manager will be responsible for ensuring that all analytical data generated under this contract are reviewed prior to their release to CDM and the USACE Project Manager. He has sufficient authority to assure that samples submitted from the project site are received and processed in accordance with this QAPP.

5.0 RECONCILIATION WITH DATA QUALITY OBJECTIVES

An assessment of data quality will be performed to determine whether data generated are consistent with the investigation objectives. If data are found to deviate significantly (several orders of magnitude) from previous analyses or surrounding conditions upon which the sampling program was based, the data may be qualified based on the validator's assessment of the usability of the data for the intended end uses.

6.0 CORRECTIVE ACTION

Corrective action is required when potential or existing conditions are identified that may have an adverse impact on data quality. Corrective action applies to both the field and laboratory procedures. In general, any member of the project team who identifies a condition adversely affecting quality can initiate corrective action. Written evidence (e.g. field or laboratory logbook) will document and identify the condition and explain the way it may affect data quality.

A well-defined and effective policy for correcting quality problems is critical to the success of a quality assurance program. While this QA program is designed to minimize problems, it must also identify and correct any problems that do exist. The corrective action system for this project will include:

- Identify the problem
- Identify cause of the problem
- Identify corrective actions to correct the problem
- Implement corrective actions
- Verify effectiveness of corrective actions in correcting the problem
- Document corrective action including:
  - Problem identified and cause
  - Corrective actions implemented
  - Effectiveness of corrective actions
  - Samples impacted by problem

Documentation of corrective actions will be included in the project file.

Appendix C

CDM STANDARD OPERATING PROCEDURES

APPENDIX C

CDM STANDARD OPERATING PROCEDURES
FOR
FIELD DATA COLLECTION

SOP Identifier	SOP Title
SOP 1-1	Surface Water and Sediment/Sludge Sampling
SOP 1-2	Sample Custody
SOP 1-5	Groundwater Sampling Using Bailers
SOP 1-6	Water Level Measurements
SOP 1-3	Surface Soil Sampling
SOP 2-1	Packaging and Shipping of Environmental Samples
SOP 2-2	Guide to Handling Investigation-Derived Waste
SOP 3-2	Topographic Survey
SOP 4-1	Field Logbook Content and Control
SOP 4-2	Photographic Documentation of Field Activities
SOP 4-5	Field Equipment Decontamination at Non-radioactive Sites

Appendix D

HEALTH AND SAFETY PLAN

Contents

1.0 STANDARD ABANDONED MINE SITE HEALTH AND SAFETY PROCEDURES

Abandoned mine sites pose three types of potentially serious risks to the casual visitor: physical, chemical, and explosive (combined physical and chemical). The following procedures and precautions will be followed by the CDM sampling team inspecting and collecting data at the Elder Creek mine site.

Abandoned mine sites involve a number of physical hazards ranging from steep, unstable slopes that could result in a serious fall; tripping hazards due to uneven terrain, debris, and abandoned equipment; unsafe and collapsed structures; unsafe (potential for collapse) adits; unsafe cribbing walls and tailing dam impoundments (risk of failure) and unprotected, vertical shafts of unknown depth. The sampling team must wear steel-toed, steel-shank work boots as a measure of protection against ground hazards (e.g., sharp metal, protruding nails). The sampling team must also wear full-length work pants (denim or similar material) to provide protection from protruding objects, rusted metal, and chemical materials (heavy metals, cyanide, low pH) that may be present at the mine site.

Under no circumstance should any member of the sampling team enter buildings or adits, or climb on any structures including crib walls. Steep slopes should be avoided. The location of any head frames (intact or collapsed) should be noted. These locations should be avoided. There may be a hidden or unstable opening to a vertical shaft near the head frame.

Chemical hazards posed by abandoned mine sites include high concentrations of heavy metals with arsenic, cadmium, and lead being of greatest concern. Soil, waste rock, and/or water may contain extremely low (<2 pH) or high (>12 pH) acidic or basic conditions that can cause skin burns, eye irritation, and/or eye damage. Various chemicals used in ore processing, including cyanide and mercury, can be present in high concentrations; therefore, caution must be used when handling and processing samples of waste rock, stained soil, or mine site runoff. The sampling team will use disposable gloves when handling samples. Hands must be thoroughly washed following sampling. Samplers should not drink or eat food during sample collection and processing.

Liquid containers (20 to 55 gallon drums, 5 to 10 gallon cans) are commonly found at mine sites. These containers typically were used to store fuels (diesel, gasoline, kerosene) and lubricating oils. The presence and condition of liquid containers should be noted in relation to the primary sample locations, but no further investigation will be performed under this study.

2.0 ELDER CREEK MINE SITE HEALTH AND SAFETY ISSUES

The Elder Creek mine site has waste materials containing cyanide. Cyanide is extremely toxic via inhalation and ingestion routes of exposure. Before sampling of any material suspected or known to contain cyanide, the area of and around the material to be sampled must be surveyed using cyanide detecting equipment. The sampler using the cyanide detecting equipment must be trained in its usage and verify its proper function through calibration tests prior to its use in the field. Field samplers must use protective gloves when sampling and handling material suspected of containing cyanide. Hands must be washed thoroughly following sampling. Field clothing should be separated from other clothing when laundered.

Explosives and dangerous chemicals may still be present at the mine site. The site was once an illicit drug manufacturing laboratory so dangerous chemicals are of concern. Crates, boxes, bottles, and bags should not be opened, but their presence noted in the field log book. Items such as blasting caps, primer cord, or dynamite sticks should be noted but never touched. If observed, the BLM and USACE project managers must be contacted immediately. The presence of these materials can be ascertained by observing the contents of sheds and structures from the outside. The scope of this study does not involve explosives or stored chemicals and no further investigation should be performed until otherwise directed by the USACE project manager.

3.0 SITE – SPECIFIC WORK ACTIVITIES GOVERNED BY THIS SAFETY PLAN

The Elder Creek Mine Site Work Plan addresses several sampling and site characterization activities potentially involving contact with soil, surface water, and groundwater containing metals. The sampling work will occur at various locations on and off the mine site.

Site activities will include the following:

- Monitoring well sampling
- Surface water (seep) and sampling
- Leach pad runoff sampling

The Work Plan, Sections 2.2, 2.3, and 2.4 provide additional details regarding these activities.

4.0 CHEMICAL HAZARD

Data collected for site waste and leach pad runoff shows the presence of cyanide and metals. Concentrations are not immediately health threatening, but waste and leach pad runoff should be handled using protective clothing and proper containment.

5.0 PERSONAL PROTECTIVE EQUIPMENT

The metals in waste and runoff do not pose an inhalation risk. Therefore, level of protection will be level D consisting of standard field clothes, steel-toed boots, and work gloves. Hard hats, hearing protection, and eye protection will be required while all drilling equipment is operating.

6.0 ELDER CREEK MINE SITE SAFETY CONCERNS CHECKLISTS

Leachate
- Gloves will be worn during sampling to prevent direct skin contact with the waste.
- Work clothes worn during sampling will be laundered separately from other personal items
- Hands will be washed following sampling and prior to eating.

Metals
- The mine waste contains elevated concentrations of metals. Gloves will be worn to prevent direct contact with the waste.

	-	Work clothes worn during sampling will be laundered separately from other personal items.
	-	Hands will be washed following sampling and prior to eating.
Groundwater	-	Groundwater at the site may contain metals above drinking water levels. Although not considered hazardous, groundwater should be handled carefully to minimize spillage from sampler while pouring into the sample containers. Protective gloves are recommended.

7.0 ELDER CREEK MINE SITE CONTACTS:

Kevin Ryan	CDM Project Manager	775-853-0333
B.J. Bailey	USACE Project Manager	916-557-6642
Robert Tallini	BLM Project Manager	775-635-4167
Robert Saiz	CDM E&C H&S Officer	303-298-1311
Chuck Meyers	CDM Federal H&S Officer	703-968-0900

Battle Mountain General Hospital	775-635-2250
Ambulance Service	911 or 775-635-2550
County/State Police	911 or 775-635-5161

8.0 ROUTE TO NEAREST MEDICAL FACILITY:

Proceed on the dirt access road from the Elder Creek mine site to Highway 305. Go north on Highway 305 into the town of Battle Mountain. The hospital is located one block north of Highway 305 on 535 S. Humboldt Street.

Appendix E

SITE SECURITY PLAN

Contents

1.0 SITE SECURITY PLAN

The Elder Creek Mine site is on land controlled by the BLM. Other than those activities described below, CDM will not be responsible for site security.

Site Access

CDM will contact BLM before entering the site. CDM will obtain from BLM the key to access the site gate. CDM will close and lock the gate after all entries and after leaving the site.

Work Site Control

CDM will maintain control of the immediate area of all work sites. This primarily will involve controlling public access to sampling and demonstration project sites. The CDM field team leader will greet all individuals approaching the work site, explain the objectives of the activity, and keep the individual(s) away from any area of physical or chemical hazard.

Limitations on Site Security

CDM has not been tasked to conduct the following site security activities, therefore, these activities will not be CDM's responsibility: maintenance or repair of fencing or gates, maintenance of signage, control of trespassers or unauthorized individuals (except in the immediate vicinity of CDM work activities), control of materials or structures on the site, nor providing a guard or a guard service.